

② **LEVEL III**

AD-E 750014

AD A090090

AIR FORCE SECTION  
U.S. ARMY COMMAND AND GENERAL STAFF COLLEGE

WEATHER SUPPORT AS A GROUND COMBAT MULTIPLIER

By

Charles F. Wills, Major, USAF

A RESEARCH STUDY SUBMITTED TO THE AIR FORCE FACULTY

May 1980

Gary E. Robison  
Major, USAF  
Research Advisor

**DTIC**  
**ELECTE**  
**S** **D**  
OCT 10 1980  
**B**

U.S. ARMY COMMAND AND GENERAL STAFF COLLEGE  
FORT LEAVENWORTH, KANSAS

DISTRIBUTION STATEMENT A

Approved for public release;  
Distribution Unlimited

DDC FILE COPY

80 7 1 028

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. <i>AD-A090080</i>	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) WEATHER SUPPORT AS A GROUND COMBAT MULTIPLIER		5. TYPE OF REPORT & PERIOD COVERED FINAL REPORT MAY 1980
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) WILLS, CHARLES F., MAJ USAF		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Student at the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. ARMY COMMAND AND GENERAL STAFF COLLEGE ATTN: ATZLSW-AF		12. REPORT DATE MAY 1980
		13. NUMBER OF PAGES 40
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; Distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) Approved for public release; distribution unlimited.		
18. SUPPLEMENTARY NOTES Air Force Research Report prepared at CGSC in partial fulfillment of course requirements, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
Weather	Combat Effectiveness	Military Requirements
Weather Communications	Combat Support	National Defense
Weather Forecasting	Military Applications	
Meteorology	Military Doctrine	
Meteorological Data	Military Operations	
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		

20. US Army ground forces are confronted by a potential adversary possessing far superior manpower and firepower. To prevail against such forces, the US Army must use every available combat multiplier. This study shows that weather support provided by Air Weather Service can be an effective combat multiplier. However, current Army weather support requirements are too general and do not facilitate support matched to real needs, many Army decision makers do not effectively use available support, and existing weather communications equipment is unreliable. If weather support is to enhance Army performance, the Army must identify specific weather support requirements, the Army must train decision makers to effectively use weather information, and the Army must obtain reliable weather communications equipment.

# ABSTRACT

US Army ground forces are confronted by a potential adversary possessing far superior manpower and firepower. To prevail against such forces, the US Army must use every available combat multiplier. This study shows that weather support provided by Air Weather Service can be an effective combat multiplier. However, current Army weather support requirements are too general and do not facilitate support matched to real needs, many Army decision makers do not effectively use available support, and existing weather communications equipment is unreliable. If weather support is to enhance Army performance, the Army must identify specific weather support requirements, the Army must train decision makers to effectively use weather information, and the Army must obtain reliable weather communications equipment.

Accession For	
ADIS (CASI)	<input checked="" type="checkbox"/>
ADIS (CASI)	<input type="checkbox"/>
ADIS (CASI)	<input type="checkbox"/>
Availability Codes	
Dist	Avail and/or Special
A	

## TABLE OF CONTENTS

	Page
ABSTRACT .....	ii
EXECUTIVE SUMMARY .....	v
Chapter	
I. INTRODUCTION .....	1
Objectives of this Study	
Significance of this Study	
Limitations of this Study	
Assumptions	
Organization	
II. CURRENT US ARMY WEATHER SUPPORT REQUIREMENTS .....	6
Weather Parameters Which Affect	
Army Missions	
Army Personnel Who Need Weather Data	
Impact of Weather Support on Army	
Tactical Planning and Execution	
III. CURRENT WEATHER SUPPORT PROVIDED TO THE US ARMY .....	13
Existing and Forecast Data Provided	
by AWS	
Army Units that Receive Weather Support	
Credibility of Current Weather Support	
Effectiveness of Current Weather Support	
IV. CURRENT WEATHER COMMUNICATIONS AVAILABLE TO US ARMY UNITS .	21
Army Units That Have Weather	
Communications Equipment	
Equipment Reliability	
Weather Communications in Combat	
V. FUTURE WEATHER SUPPORT TO THE US ARMY ...	25

Support Matched to the Mission  
Improved Weather Support Credibility  
Improved Weather Communications Equipment

VI. CONCLUSIONS AND RECOMMENDATIONS .....	31
Conclusions	
Recommendations	
FOOTNOTES .....	34
BIBLIOGRAPHY .....	38

## EXECUTIVE SUMMARY

**QUALIFIER:** Part of the mission of the US Army Command and General Staff College is distribution of student research products to interested DoD Agencies to enhance the potential for new insights into Defense related problems/issues. While the College has accepted this product as meeting academic requirements for graduation, the views and opinions expressed or implied are solely those of the author and should not be construed as carrying official sanction.

**TITLE:** WEATHER SUPPORT AS A GROUND COMBAT MULTIPLIER

**AUTHOR:** MAJ CHARLES F. WILLS

**ADVISOR:** MAJ GARY E. ROBISON

I. Purpose: To determine if weather support provided to the US Army by Air Weather Service can be an effective ground combat multiplier by investigating the weather support actually required by the Army, the weather support currently being provided to the Army, and the weather communications systems available to support the Army.

II. Problem: US Army ground forces are confronted by potential adversary forces possessing significantly superior manpower and firepower. This is true for every conceivable level of combat. To have any chance of victory against such superior forces, the Army must make maximum use of every available factor which can improve combat effectiveness. Air Weather Service (AWS) is responsible for providing general weather sup-

port for the Army. If the weather support provided by AWS is to qualify as a ground combat multiplier, the support must be matched to real Army requirements, Army decision makers must know how to use it, and the support must be available when it is needed. Apparent shortfalls in existing weather support negate the effectiveness of weather support as a ground combat multiplier.

III. Data: Every available unclassified official document and every article published from 1968 through March 1980, as well as every unclassified Army and Air Force publication that in any way discusses weather support for the Army was examined for evidence related to the stated problem. To obtain subjective evidence regarding the credibility and effectiveness of current weather support, the author discussed the problem informally with over 30 Army officers attending the Army Command and General Staff College, class of 1980. All the officers involved were experienced in at least one of the following areas: Company Commander, Battalion S2 or S3, Brigade G2 or G3, Division Assistant G2 or G3.

IV. Conclusions: Based on a non-quantitative analysis of objective and subjective evidence, Army weather support requirements as currently stated are too general



and do not facilitate weather support matched to real needs, many Army decision makers do not effectively use available weather support, and existing weather communications equipment is unreliable.

V. Recommendations: The following actions must be accomplished before the weather support provided to the Army by AWS can qualify as an effective ground combat multiplier: the Army must identify specific weather support requirements, the Army must train decision makers to effectively use weather information, and the Army must obtain reliable weather communications equipment.

## CHAPTER I

### INTRODUCTION

The effects of weather on military operations, friendly or enemy, have traditionally been ignored or slighted in favor of placing more emphasis on analysis of the enemy or the terrain. Weather, however, has and will continue to have a profound effect on the outcome of the battle. Therefore, commanders should be aware of what future weather conditions are going to be so plans can be made or changed to gain the maximum advantage of the expected weather conditions.<sup>1</sup>

#### Objectives of this Study

This research paper will attempt to validate the hypothesis that timely and accurate weather support matched to Army requirements and effectively communicated to Army decision makers can significantly enhance ground combat effectiveness. The primary objectives of the paper are to (1) identify the weather support required by the US Army, (2) determine the ability of the USAF Air Weather Service (AWS) to provide the required weather support, (3) determine the adequacy of current weather communications systems available to AWS for US Army support, and (4) propose possible improvements in collecting, forecasting, and communicating weather data to support the US Army ground combat

mission.

### Significance of this Study

There are two basic reasons for conducting this study. First, AWS, which is responsible for providing general weather support to all echelons of the Army, must make every effort to ensure all its products and services are tailored to real needs with a minimum of wasted effort. This is especially true with the current congressional mandate to "do more with less". However, in September 1979 the Army Tactical Weather Support Concept developed by the US Army Intelligence Center and School, and the US Army Combined Arms Combat Developments Activity, identified three major shortfalls relating to weather support. The first shortfall is the Army's failure to specifically identify what weather information is needed from the AWS.<sup>2</sup> The Combined Arms Combat Developments Activity (CACDA) and other agencies of the US Army Training and Doctrine Command (TRADOC) have been working toward a statement of Army tactical weather support procedures, including specific weather support requirements, for several years. In May 1980, the CACDA Staff Weather Officer, LTC Darrell T. Holland, in a face-to-face conversation, and the TRADOC Staff Weather Officer, in a telephone conversation, both said the statement of Army tactical weather support pro-

cedures was still being developed. They both further stated that a list of specific weather support requirements had been approved by the Department of the Army in December 1978, however the requirements are still subject to change and have not been formally submitted through channels to AWS. None of the individuals or agencies with whom I discussed the situation had any idea when, or if, the weather support procedures and requirements now being considered would be published in a form usable by Army commanders or the Air Force Staff Weather Officers who support them. The second shortfall identified is the fact that Army tactical commanders and planners are not adequately trained to effectively evaluate and use weather data.<sup>3</sup> Both of these shortfalls indicate the US Army may not know what its real weather support requirements are, and worse, may not be effectively using the support it does receive. The third shortfall is the lack of adequate weather communications systems.<sup>4</sup> This shortfall indicates the US Army may not be able to receive all the weather data it requires in a timely manner. This study will provide possible responses to these Army identified shortfalls.

The second, and perhaps more important reason for conducting this study is the fact that the US Army, confronted as it is with a potential adversary posses-

sing significantly greater manpower and firepower, must make maximum use of every available factor to enhance its combat effectiveness. If weather support can be a ground combat multiplier, the US Army, and AWS, must fully exploit this fact.

#### Limitations of this Study

This study considers only those weather services and products provided to the US Army by AWS, and excludes weather services and products provided to the US Army by Army units. This study will not perform any technical analysis or evaluation of current or projected weather observing/weather forecasting skill. Rather, the study will accept as valid the judgements regarding existing and future state-of-the-art that are described in current National Weather Service and Air Weather Service publications.

#### Assumptions

This study assumes the present general support relationship between the USAF Air Weather Service and the US Army will not change in the foreseeable future. The study also assumes improvements in weather support capability which significantly increase effectiveness and/or reduce costs will be implemented.

#### Organization

This study is built around four major themes.

The first theme examines the weather service support that is actually required by the US Army. This includes a discussion of the weather parameters which affect Army missions, the Army personnel who need weather data, and the impact this data has on mission planning.

The second theme describes the weather support that is received by the US Army now. The description includes a discussion of weather data provided, the Army agencies that receive weather data, and the credibility and effectiveness of the weather support.

The third theme describes and evaluates the weather communications systems which support the US Army. This discussion includes the agencies which have access to the equipment, equipment reliability, and an assessment of the weather communications which can be expected in combat situations.

The fourth theme discusses possible improvements in weather support provided to the US Army by AWS. These improvements involve increased utility and credibility of the weather support, plus more reliable weather communications equipment.

## CHAPTER II

### CURRENT US ARMY WEATHER SUPPORT REQUIREMENTS

To qualify as a ground combat multiplier, weather support must enable a tactical commander to improve the combat performance of available resources, both people and weapons systems, compared to their performance if the weather support was not available or was not considered. Current US Army doctrine recognizes that weather information is, or at least can be, a combat multiplier.<sup>5</sup>

The US Army's current stated requirements for weather support from AWS are specified in AR 115-12, AR 115-10/AFR 105-3, FM 31-3/AFM 105-4, and TC 30-11. These publications also indicate the US Army personnel who need the required AWS weather support and the impact this support has on Army tactical planning and execution.

#### Weather Parameters Which Affect Army Missions

The primary meteorological parameters which the US Army has identified as having a significant affect on Army missions and which are provided totally or in part by AWS are: visibility, precipitation (type and amount),

surface winds (speed and direction), cloud cover (amount and height above the ground), temperature and humidity.<sup>6</sup> Good visibility increases reconnaissance, surveillance, and target acquisition ability, and usually favors the defender over the attacker.<sup>7</sup> Poor visibility enhances concealment, and if very poor, can virtually eliminate the direct fire capability of Army maneuver units.<sup>8</sup> Reduced visibility usually benefits the attacker by making deceptive actions more effective.<sup>9</sup> Precipitation usually reduces troop morale and may seriously reduce equipment and troop mobility, including the movement of essential combat service support. Precipitation also usually degrades surveillance equipment, including RADAR, sound detection and infrared devices.<sup>10</sup> Surface winds affect most aircraft operations, and significantly affect the accuracy of weapons, especially the first round kill probability of direct fire weapons.<sup>11</sup> Surface winds may be a determining factor when planning the use of smoke, chemical or even nuclear weapons, and should be a major factor when planning a defense against these weapons by enemy forces.<sup>12</sup> Cloud cover significantly impacts both friendly and enemy air activity, which in turn affects ground tactics. Extensive low cloud cover may give a tactical advantage to the force that does not have control of the airspace by reducing



the effectiveness of the force that has airspace control. Cloud cover often affects ground operations by limiting visibility and illumination.<sup>13</sup> Temperature and humidity affect personnel performance, and in the extreme, may affect the health and safety of personnel. Much of the Army's equipment, including aircraft and tanks, simply do not function efficiently when the air is extremely hot or cold.<sup>14</sup> Temperature can also have a significant effect on equipment mobility. For example, frozen ground may provide excellent track and wheel traffickability, however, a small increase in temperature may change the same area into an impassable mud morass.<sup>15</sup>

All of these weather parameters affect US Army tactical ground operations. Therefore, to effectively plan and execute successful military operations in either peace or war environments, the US Army needs accurate and timely weather information which includes existing and forecast values of these parameters.

#### Army Personnel Who Need Weather Data

Who really needs the weather information which AWS provides to the Army? I believe every Army tactical commander who must decide who, where, when and how to deploy forces should know as much as possible about the impact of weather on the operation. This means the commander, G2 or S2 and G3 or S3 must have state-of-the-art

weather support beginning with the planning phase of the operation and continuing through the completion of the mission. This is true of every echelon of command from theater down to company. To effectively use the weather information every Army commander, G2/S2, and G3/S3 who is involved in troop/force deployments must know as much as possible about the effects of weather parameters on both friendly and enemy troops, equipment, and terrain. These same people should also recognize that meteorology, including the observing of existing weather as well as the forecasting of future weather, is an inexact science--that AWS cannot provide error-free weather support.<sup>16</sup>

#### Impact of Weather Support on Army Tactical Planning and Execution

At first glance, the weather itself appears to be neutral in its impact on military operations, affecting friendly and enemy forces equally. However, this is a false impression. Adverse weather, for example, is far more a hindrance to the forces planning to initiate action that requires good weather, such as a brigade size counterattack with extensive close air support. On the other hand, good weather may hinder forces planning to conduct a surprise operation, such as an infantry battalion infiltration behind enemy positions.

Therefore, if the US Army is given the weather support it requires, if Army decision makers understand the impact of weather on their operations, and if they are willing to incorporate the weather information in their mission plans, then US Army tactical operations can be planned and executed to maximize the positive effects of the weather and minimize the negative effects of the weather. This means weather support can be an effective ground combat multiplier.<sup>17</sup>

However, there is one serious problem relating to the Army's current stated requirements for AWS provided weather support. All the current Army publications and directives that discuss weather requirements state the requirements in very general terms. Army Regulation 115-12, US Army Requirements for Weather Service Support, dated 1 December 1977, is extremely brief and refers the reader to Field Manual 31-3 for details.<sup>18</sup> Field Manual 31-3/Air Force Manual 105-4, Weather Support for Field Army Tactical Operations, dated 4 December 1969, contains numerous obsolete references and procedures. All references to weather requirements are very general, e. g., command and staff agencies need 12 hour, 24 hour, 48 hour, 72 hour and 3-5 day forecasts; or aviation units at corps and division level require surface observations.<sup>19</sup> This direc-

tive does not identify the weather parameters which are of concern to the various Army units or echelons and does not specify what degree of accuracy is required for the weather parameters. Likewise, Army Regulation 115-10/Air Force Regulation 105-3, Meteorological Support for the US Army, dated 9 June 1970, and Training Circular 50-11, Army Tactical Weather, dated 29 April 1977, list only general requirements for AWS provided weather support.

Perhaps because the requirements are so general, the weather data usually presented to Army units by AWS is also usually in a standard generalized format. Practically all of the many experienced Army officers I talked to while a student at the Army Command and General Staff College, class of 1980, described the same generalized weather briefing format. The briefings they describe were tailored only to a specific time period and area. Few reported any attempt to relate the weather information to the specific weapons system involved or type of mission to be accomplished.

"Identify loudly and clearly your intelligence requirements."<sup>20</sup> This advice was given by an Army General Officer to tactical commanders and decision makers who want to avoid surprise in tactical situations. The general goes on to say too many commanders and

decision makers are content to accept whatever information the system produces.<sup>21</sup> Today's Army is apparently willing to accept whatever weather support is provided by AWS, since the Army has not either clearly or loudly identified specific weather support requirements. As a direct result, weather information plays a relatively minor role in most of the tactical operations planned and executed by the Army.

The world we live in does not have any true "all weather" armies, including the US Army.<sup>22</sup> In all probability the sophisticated weapons of the future will be even more weather sensitive.<sup>23</sup> Therefore, the Army does need accurate and timely weather information to effectively plan and execute tactical operations. Every tactical commander, G2/12, and G3/S3 down to company level needs access to this accurate and timely weather information. Unfortunately, much of the benefit of accurate and timely weather support is unused because the Army has not identified specific weather requirements.

### CHAPTER III

#### CURRENT WEATHER SUPPORT PROVIDED TO THE US ARMY

Current joint Army/Air Force doctrine states that AWS will provide operational weather support to Army tactical units that do not have organic weather support capability.<sup>24</sup> Typically, AWS provides direct weather support to corps, division and separate brigade headquarters, and to major Army airfields.<sup>25</sup> This AWS provided support includes weather observations, weather forecasts, weather briefings, and climatic studies.<sup>26</sup>

#### Existing and Forecast Data Provided by AWS

AWS surface weather observations are taken every hour, or as required, and provide a record of existing weather conditions at a specific location. The recorded weather conditions include surface winds, visibility, obstructions to vision, cloud cover, temperature, dew-point, altimeter setting and any remarks determined appropriate by the weather observer. These observations may also include pressure altitude, density altitude, station pressure, snow depth, maximum and minimum tem-

perature, and/or the wind chill index.<sup>27</sup> AWS weather observing stations are normally positioned to support corps and division headquarters and Army aviation units. These stations are almost never located forward of the division headquarters.<sup>28</sup> Since the number of AWS observing stations is very limited, AWS obtains additional surface and upper air observations from foreign nation weather stations, when the data is available, plus supplemental weather data from organic Army sources. For example, Army artillery meteorology sections usually provide upper air observations every 2-4 hours. These observations include temperature, dewpoint, wind speed and direction, and pressure data at various levels up to a predetermined height, or until the weather balloon breaks.<sup>29</sup> Upon request, limited surface weather information such as temperature, humidity, precipitation, pressure and wind speed and direction, is sometimes available from Army engineer, aviation, and medical units,<sup>30</sup> however, this information is seldom available with the frequency or speed desired.

AWS weather forecasts are statements of weather conditions expected at a specific location or area usually from 2 to 72 hours from the time the forecast is prepared.<sup>31</sup> The standard parameters included in these forecasts are: a general description of the weather situation, cloud cover, height of the clouds, visibility,

precipitation, obstructions to vision, severe weather (if any), surface winds, and temperature range.<sup>32</sup> These forecasts are issued at 6 or 12 hour intervals, or as required. In addition, AWS forecasters supporting Army units typically provide a 3 to 5 day general outlook forecast every duty day and longer range outlooks as required.<sup>33</sup> Aviation forecasts are issued for a 24 hour period every 6 hours and include cloud amounts and heights, visibility, precipitation or other obstruction to vision, surface wind speed and direction, as well as turbulence or icing conditions.<sup>34</sup> Weather warnings are issued on an as required basis to advise users of the possible occurrence of weather conditions which demand prompt action to safeguard people, equipment, and/or facilities from injury or destruction. Weather warnings are typically issued for tornadoes, hail, and strong winds.<sup>35</sup> The accuracy of all forecast products depends on the number and validity of weather observations from the area or location, the type of terrain, the season of the year, the reliability of weather communications available, the length of the forecast period, and the skill and experience of the forecaster.<sup>36</sup>

Weather briefings normally include both existing and forecast weather conditions that are expected to affect the decision of the tactical commander and/or



staff members who are receiving the briefing. Weather briefings may be given in person or via whatever communications system is available. They may be presented as part of scheduled formal meetings or given in impromptu situations.<sup>37</sup>

Climatic studies use the analysis and interpretation of historical weather data, including averages, extremes, and frequencies of occurrence of various parameters to determine probable weather impact on planned tactical operations.<sup>38</sup> Climatic studies are almost always included in the planning documents for an operation, including exercises, so that tactical commanders and decision makers at all echelons will have access to the same weather data when planning for their portion of the operation.

#### Army Units that Receive Weather Support

AWS provides observing and forecasting support to Army units through Staff Weather Officers (SWOs). AWS provides a SWO at each Army element that is authorized direct weather support, i.e., in-person weather support.<sup>39</sup> The SWO plans, arranges, and/or provides required weather information to the tactical commander and/or staff through the Army unit G2/S2. At corps and division, the SWO is normally a member of the special staff, and is supervised by the G2. The SWO is avail-

able to help interpret the impact of expected weather conditions on both friendly and enemy operations. The SWO is assisted by one or more weather teams (WETMs). Each WETM is composed of AWS weather observers and forecasters, and is capable of operating continuously, 24 hours per day, seven days a week, for extended periods.<sup>40</sup>

Under current joint Army/Air Force doctrine and practice, most AWS provided weather support is concentrated at the corps and division level.<sup>41</sup> This is based on the fact that most of the Army's detailed operational mission planning is done at corps and division level. Weather support for mission planning is normally given to the G2 who incorporates the weather information with other intelligence data before coordinating the plan with the G3 and, finally, with the tactical commander. Weather support for the execution of an operation is usually given in person by the SWO to the G2, G3, and the unit commander in the same formal briefing. Weather support to echelons below division that do not have their own SWO is provided through G2/S2 channels via telephone, radio, and/or teletype.<sup>42</sup> The weather information is often simply an abbreviated version of what the SWO briefed to corps or division, and may be given by the SWO or by a higher echelon G2/S2 who has access to the required information.<sup>43</sup>

### Credibility of Current Weather Support

Most of the US Army publications that discuss weather support are careful to remind tactical commanders and decision makers that meteorology is an inexact science, and therefore they should not expect perfect weather support.<sup>44</sup> I believe most Army commanders and staff officers recognize and accept the limitations of existing weather support. The network of weather observing stations is not adequate in many parts of the world, including parts of Europe and even the US.<sup>45</sup> Weather communications are often slow and unreliable. Weather observers, forecasters and SWO's differ greatly in both skill and experience. In addition, based on my experience, all regular users of weather information tend to remember the occasional "busted" weather forecast or the inaccurate weather observation, and very quickly forget the many accurate forecasts and observations they receive. The net result of the objective facts about weather support limitations and the subjective feelings about weather support limitations is that AWS provided weather support to the US Army is not very credible.

Obviously, in some situations the Army tactical commander has little or no choice regarding the weather conditions under which the battle must be fought.<sup>46</sup>

This is particularly true of echelons below division, which are often told where, when and how to engage the enemy. Perhaps using this fact as an excuse, or perhaps overreacting to the existing weather support limitations, too many Army commanders and decision makers choose to ignore or disregard the weather information they receive and instead base their mission planning or execution decisions only on the perceived enemy situation and the terrain.<sup>47</sup>

#### Effectiveness of Current Weather Support

After numerous discussions with experienced Army officers, including former company commanders, battalion S2s, battalion S5s, division assistant G2s and division assistant G3s, I am convinced much of the weather support provided to the Army by AWS is not effectively used. Too many Army tactical commanders, planners, and other decision makers do not know how various weather conditions or parameters affect their people or equipment or even their weapons systems. Too many do not understand weather terminology and do not know how to incorporate weather information into their operation/mission planning or execution. Only a few fully use the SWO's expertise to find ways to minimize the negative effects of anticipated weather conditions

and to take full advantage of the positive effects of the expected weather conditions. The basic impression I have received from my discussions with Army officers is that AWS weather support is nice to have but not critical. As long as this attitude prevails, weather support provided to the Army by AWS will not be effectively used by Army commanders or decision makers regardless of the accuracy and timeliness of the support. At the same time, AWS will have little reason to improve the quality of weather support to the Army.

After researching all available unclassified publications and reports dealing with weather support to the Army issued during the past 12 years, and after numerous discussions with experienced Army officers, I am convinced that AWS can and does provide the weather observing and forecasting support which is requested by the Army. However, evidence suggests that AWS provided weather support is not very credible among Army tactical commanders and decision makers, and is too often not effectively used.

## CHAPTER IV

### CURRENT WEATHER COMMUNICATIONS AVAILABLE TO ARMY UNITS

#### Army Units that Have Weather Communication Equipment

Current joint Army/Air Force doctrine requires the Air Force through the Air Force Communications Command (AFCC) to provide reliable weather communications support from CONUS down to the AWS WETM supporting the highest Army echelon in a theater of operation.<sup>48</sup> For example, if a corps is the highest Army echelon in a theater, the AFCC would provide weather communications from CONUS AWS units, through any intermediate headquarters, to the corps WETM. The Army provides weather communications to all lower echelons in the theater.<sup>49</sup> The following Army elements normally have access to weather communications: WETMs at corps, divisions, brigades, Army airfields, and command posts down to brigade level.<sup>50</sup> By using radio communications, almost any Army element can request and receive required weather data.

#### Equipment Reliability

Weather information is extremely perishable. Each weather observation must be transmitted immediately after it is taken and recorded, otherwise, it is useless.<sup>51</sup> The same observation must be received within a few minutes by numerous users, including tactical units and AMS personnel at many locations who use the data to prepare weather maps and forecasts. If it is not received, it is, again, useless. Weather forecasts can be accurate and issued when requested only if current weather observations and forecasts from other locations are continuously available.<sup>52</sup> Quality weather support therefore depends in great measure on rapid, dependable and dedicated (continuously available for weather data only) communication equipment.<sup>53</sup> Unfortunately, most of the weather communications equipment used by the US Army is neither fast nor reliable. For example, during Exercise Reforger 79, WETMs at corps, division and brigade level reported usable weather communications only about 50 percent of the time.<sup>54</sup> Most of the equipment used is very old and worn, and therefore subject to frequent breakdowns. The teletype printers were designed over 30 years ago and were intended to operate at 60 words per minute. Continuous heavy transmission requirements cause the weather communications equipment operators to adjust the equipment to operate at 100 words per

minute, resulting in more frequent breakdowns.<sup>55</sup> By way of contrast, the teletype machines used by AWS units in the continental United States (CONUS) routinely operate at speeds up to 1200 words per minute.

Many weather communications links outside the CONUS rely on high frequency (HF) or ultra high frequency (UHF) radio transmission. In addition to the normal problems associated with radio transmission, e. g., interference caused by sunspot activity and/or various weather conditions, weather communications using these links are frequently degraded by the fact that weather users typically have a low priority among the radio users.<sup>56</sup> The net result is that required weather information is too often either not transmitted or is delayed too long to be of any value.<sup>57</sup>

#### Weather Communication in Combat

The weather communications situation which AWS faces in trying to support the Army in peacetime is bad enough. However, during actual combat weather communications are likely to be completely unusable for long periods of time, leaving most Army elements with virtually no weather support. The HF and UHF radio links are subject to enemy jamming, and when not jammed will almost certainly be in constant demand by higher priority users, and thus not usable by weather personnel.



The old teletype and related equipment is very trouble prone. Once the equipment is out of service it is likely to remain unusable until well after the hostilities cease and all higher priority equipment is repaired.

One of the greatest problems affecting AWS weather support to the US Army is slow and unreliable weather communications equipment. AWS simply cannot provide state-of-the-art weather support without the rapid and continuous exchange of weather information among all the producers and users of weather information. Without rapid and dependable weather communications equipment, the most accurate and timely weather observation or forecast is useless except to those few elements that are located with or near the WETM.

## CHAPTER V

### FUTURE WEATHER SUPPORT TO THE US ARMY

#### Support Matched to the Mission

If AWS weather support is to have any significant impact on the effective use of ground combat forces by the US Army, i. e., serve as a ground combat multiplier, that support must be specifically matched to each operational mission.<sup>58</sup> This should be done now, and in the future, with the flood of additional battlefield information provided by automation and sophisticated but highly weather-sensitive weapons systems, mission tailored weather support will be even more vital to success.<sup>59</sup> New and projected weapons systems using electro-optical, infrared, RADAR, LASAR, or a combination of these techniques to locate and lock-on to targets will be extremely accurate, but also extremely expensive and therefore limited in number available.<sup>60</sup> Tactical unit commanders and decision makers must know how weather conditions affect these weapons and incorporate expected weather information in the mission planning and execution to make sure each weapon is used at maximum efficiency.

Before AWS or SWOs or WETMs can provide meaningful mission tailored weather support, the Army must discover and state what its weather support requirements are. Infantry, armor, aviation, artillery, engineers, intelligence, combat service support, and all other Army elements are affected to some degree by the weather. In a given situation, each Army element will be affected differently and will therefore need different weather information for mission planning and execution.<sup>61</sup> For each type of tactical operation and each weapon system the Army should carefully determine and clearly state specific weather requirements, to include critical values and desired accuracy. These requirements should then be coordinated with AWS to insure they are within the existing state-of-the-art, and then published in an easy to use form that is readily available to AWS personnel and all tactical unit users. The Army should then train all tactical commanders, planners, and decision makers to recognize and understand the impact of weather conditions on their operations, including effects on troops and weapons systems, and to know how to make the best of the expected weather conditions. These same Army leaders should be trained to request any non-standard weather support from their SWO as soon as the need is identi-

fied. AWS should train SWOs who support Army units to know the specific weather requirements of the units they support, to help the Army tactical unit commanders and decision makers determine their best possible actions in light of expected weather conditions, and to help Army personnel to recognize and state non-standard weather requirements clearly and precisely.

#### Improved Weather Support Credibility

Weather support suffers from its own version of "Catch 22". To be effective, weather support must be credible, however, to be credible, weather support must be effective. To put it another way, no one will want to use weather information that is not reasonably accurate and timely, and even accurate and timely weather information will not be used if those who receive it do not believe it is useful. AWS can improve the credibility and, therefore, the usefulness of its weather support by improving the accuracy and timeliness of the weather support products, especially weather forecasts and briefings. Since the accuracy of weather forecasts depends to a great degree on the number of current weather observations available from the area of interest, AWS can improve its battle area forecasts by increasing the number of weather observing sites in these areas. The most feasible means to accomplish

this is to place small unmanned, fully automated weather observing sites along and behind the forward edge of the battle area (FLBA). These instrumented packages are small enough to be put in place by hand, by artillery, or by airdrop from Army or Air Force aircraft.

Another, admittedly more expensive, method of improving weather forecasts and at the same time greatly increasing the coverage of observed weather would be to provide at all echelons down to division self-contained equipment capable of receiving direct photographs from weather satellites. Some have called the weather satellite the most important innovation of the Vietnam war.<sup>62</sup>

The satellite picture receiving equipment can provide AWS personnel and military decision makers with photo quality visual or infrared images of existing weather conditions in virtually any area of interest with resolution as high as 0.3 kilometer.<sup>63</sup> The weather satellite pictures are transmitted as often as every 30 minutes and can provide near real time weather data for areas where no other weather information is available, e.g., enemy controlled areas.<sup>64</sup> The feasibility of developing relatively small direct readout satellite picture receiving equipment, transportable by C-119 or C-141 aircraft, has already been demonstrated.<sup>65</sup> This equipment would be suitable for use in the tactical

environment.

AWS can also enhance the credibility of its weather support to the Army by training SMOs to present every forecast or briefing and answer every weather related question with confidence and assurance. Education is another way to increase the credibility of weather support. As more Army commanders and decision makers learn the full value of weather support and how to use it effectively, they will be more likely to accept the imperfections in weather support and make the best use of the support that is provided.

#### Improved Weather Communications Equipment

Perhaps the most critical element in future AWS support to the US Army is weather communications. In my opinion, and that of virtually all the Army officers I have talked with, existing weather communications equipment and procedures, especially to echelons below division, are not acceptable and contribute significantly to the ineffective use and lack of credibility of AWS weather support within the Army. Therefore, fast, dependable, and secure weather communications equipment should be acquired by the Army and put into operation as soon as possible. The equipment should be as simple as possible, and should be compatible with the various sources of electrical power available

to the Army in the field. To insure the continuous flow of vital weather information, at least one dedicated alternate source of weather information should be available at each Army echelon.

The future could see major improvements in AWS support to the Army. However, this will happen only if the Army will identify specific and realistic weather support requirements that will facilitate mission tailored weather support, if AWS will improve the credibility of its weather support products, if the Army will realize the value of weather information and train its people to use it, and if the Army will obtain reliable, fast weather communications equipment.

## CHAPTER VI

### CONCLUSIONS AND RECOMMENDATIONS

#### Conclusions

In 1968 General Creighton W. Abrams wrote, "Never in the history of warfare have weather decisions played such an important role in operational planning as they have here in Southeast Asia."<sup>66</sup> However, in 1980 the US Army and the US Air Force's Air Weather Service are apparently not convinced that weather support can have any more than a minor impact on the outcome of military operations. US Army commanders and decision makers have been very slow to determine and make known to AWS their specific weather information requirements. Many Army commanders and decision makers do not effectively evaluate and use weather data either in planning or executing military operations. Too many Army people doubt the ability of AWS SWOs and WETMs to provide useful data, which if properly manipulated, could affect the outcome of a battle. The US Army continues to provide old and unreliable weather communications equipment for the exchange of weather information within a theater. Too many SWOs are content to give the weather



briefing only, without attempting to help the users effectively interpret and use the information. And finally, AWS has not pushed hard enough to convince the Army that weather support is really valuable--valuable enough to support with state-of-the-art communications and effective training.

#### Recommendations

1. That the Army identify the specific weather support requirements for each standard mission and weapon system, coordinate the requirements with AWS, and publish the requirements in a concise accessible form.
2. That the Army insure its tactical planners and decision makers at each echelon are thoroughly trained to understand, evaluate, and employ weather information.
3. That the Army immediately obtain state-of-the-art weather communications equipment.
4. That AWS insure all Army support SMOs and WETMs are thoroughly trained to provide weather support matched to Army needs and to help Army people evaluate and use weather data effectively.

Can accurate and timely weather support matched to Army requirements and effectively communicated to Army decision makers significantly enhance ground combat effectiveness? I believe the answer is yes, weather support can be a ground combat multiplier. However,

the weather support that is now provided to the Army by AWS is often not believed sufficiently, or communicated effectively, or used appropriately enough for the weather support to qualify as a ground combat multiplier. If the recommendations included in this study are accomplished, I believe the weather support will be a significant ground combat multiplier.

## FOOTNOTES

### Chapter I

1. Training Circular 30-11, Army Tactical Weather (Washington, DC: Headquarters, Department of the Army, 29 April 1977), p. ii. Hereafter cited as TC 30-11.

2. Tactical Weather Support Concept (Ft. Leavenworth, Kansas and Ft. Huachuca, Arizona: Army Combined Arms Combat Developments Activity and Army Intelligence Center and School, September 1979), p. 10. Hereafter cited as Concept.

3. Ibid.

4. Ibid.

### Chapter II

5. Field Manual 100-5, Operations, (Washington, DC: Headquarters, Department of the Army, 29 April 1977), p. 7-4.

6. Field Manual 31-3/Air Force Manual 105-4, Weather Support for Field Army Tactical Operations (Washington, DC: Departments of the Army and the Air Force, 4 December 1969), p. 4-6. Hereafter cited as FM 31-3.

7. Field Manual 30-5, Combat Intelligence (Washington, DC: Headquarters, Department of the Army, 30 October 1973), p. 2-18. Hereafter cited as FM 30-5.

8. Major D. V. McDonald, "Weather Service--A Decision-Making Must," Military Review, Vol. 54, No. 11 (November 1974), p. 79.

9. FM 30-5, p. 2-18.

10. Ibid., p. 2-19.

11. McDonald, p. 79.

12. FM 30-5, p. 2-20.
13. Ibid., p. 2-19.
14. Ibid.
15. Ibid.
16. FM 31-3, p. 4-13.
17. Ibid., p. 1-8.
18. Army Regulation 115-12, US Army Requirements for Weather Service Support (Washington, DC: Headquarters, Department of the Army, 1 December 1977), p. 1.
19. FM 31-3, p. 2-12.
20. Brigadier General Robert W. Williams, "Surprise: The Danger Signals," Army Magazine, April 1974, p. 12.
21. Ibid.
22. McDonald, p. 79.
23. Ibid.

### Chapter III

24. FM 31-3, p. 1-1.
25. Ibid., p. 4-4.
26. TC 30-11, pp. 16-17.
27. Ibid.
28. FM 31-3, p. 4-5.
29. TC 30-11, p. 16.
30. Ibid.
31. Ibid., p. 17.
32. Ibid.

- 33. Ibid.
- 34. Ibid.
- 35. Ibid.
- 36. FM 31-3, p. 2-1.
- 37. TC 30-11, p. 17.
- 38. Ibid.
- 39. FM 31-3, p. 4-1.
- 40. Ibid.
- 41. Ibid., p. 3-4.
- 42. TC 30-11, p. 16.
- 43. Ibid.
- 44. FM 31-3, p. 4-13.
- 45. Ibid.
- 46. TC 30-11, p. 7.

47. John Metzko and Henry Hidalgo, IDA Paper P-1297, Weather Information and Tactical Army Activities: Part 1, Assessment of the Operational Utility of Mesoscale Weather Forecasting Improvements for Army Forces (Arlington, Virginia: Institute for Defense Analysis, June 1979), p. 80.

#### Chapter IV

- 48. TC 30-11, p. 13.
- 49. Ibid.
- 50. Ibid.
- 51. FM 31-3, p. 5-1.
- 52. Ibid.
- 53. Ibid., p. 3-4.

54. John Metzko and Henry Hidalgo, IDA Paper 2-1297, Weather Information and Tactical Army Activities: Part 2, Increasing Army Effectiveness Through Improvements in Weather Information Systems (Arlington, Virginia: Institute for Defense Analysis, June 1979), p. 2-3. Hereafter cited as IDA Part 2.

55. IDA Part 2, p. E-7.

56. Ibid.

57. Ibid.

#### Chapter V

58. FM 31-3, p. 2-8.

59. Air Weather Service Electro-Optical Handbook Vol. 1, Weather Support for Precision Guided Munitions (Scott AFB, Illinois: Air Weather Service, 1976), p. 3.

60. Ibid.

61. McDonald, p. 84.

62. Majors E. R. Dash and W. D. Meyer, "The Meteorological Satellite, An Invaluable Tool for the Military Decision-Maker," Air University Review, Vol. 29, No. 3 (March-April 1978), p. 13.

63. Ibid., p. 17.

64. Ibid., p. 18.

65. Ibid., p. 20.

#### Chapter VI

66. John F. Fuller, Weather and War (Scott AFB, Illinois: Military Airlift Command, 1974) p. 13.

## BIBLIOGRAPHY

### Articles and Periodicals

- Beran, D., et. al. "Airport Weather Service: Some Future Trends," Bulletin of the American Meteorological Society, Vol. 58, No. 11 (November 1977).
- Dash, Major E. R. and Major W. B. Meyer. "The Meteorological Satellite, An Invaluable Tool for the Military Decision-Maker," Air University Review, Vol. 29, No. 3 (March-April 1978), pp. 13-24.
- Fawcett, E. B. "Current Capabilities in Prediction at the National Weather Services' National Meteorological Center," Bulletin of the American Meteorologist Society, Vol. 58, No. 2 (February 1977).
- McDonald, Major D. V. "Weather Service--A Decision-Making Must," Military Review, Vol. 54, No. 11 (November 1974), pp. 75-84.
- Williams, Brigadier General Robert W. "Surprise: The Danger Signals," Army Magazine (April 1974), pp. 10-16.
- Zeigler, LTC Gary S. "Weather Problems Affecting Use of Precision Guided Munitions," Naval War College Review, Vol. 32, No. 3 (May-June 1979), pp. 95-106.

### Official Documents

- Air Force Regulation 23-31, Air Weather Service. Washington: Department of the Air Force, 16 November 1978.
- Air Weather Service Electro-Optical Handbook: Vol. 1, Weather Support for Precision Guided Munitions. Scott AFB, Illinois: Air Weather Service, 1978.
- Air Weather Service Regulation 55-9, Tactical weather System Operations. Scott AFB, Illinois: Air Weather Service, 25 August 1975.

- Air Weather Service Regulation 105-10, Exchange of USA--  
USAF/AFWS Meteorological Data. Scott AFB, Illinois:  
Air Weather Service, 17 November 1976.
- Army Regulation 115-10/Air Force Regulation 105-3,  
Meteorological Support for the US Army. Washington:  
Departments of the Army and the Air Force,  
4 December 1969.
- Army Regulation 115-12, US Army Requirements for Weather  
Service Support. Washington: Department of the  
Army, 1 December 1977.
- Army Tactical Weather Support Concept. Ft. Leavenworth  
and Ft. Huachuca: Army Combined Arms Combat Develop-  
ments Activity and Army Intelligence Center and  
School, September 1979.
- Department of Commerce Document No. S-T 76-241,  
National Weather Service Forecasting Handbook No. 1.  
Washington: Department of Commerce, 1976.
- Field Manual 1-50, Meteorology for Army Aviators.  
Washington: Department of the Army, 31 May 1976.
- Field Manual 6-15, Field Artillery Meteorology. Washing-  
ton: Department of the Army, 30 August 1978.
- Field Manual 50-5, Combat Intelligence. Washington:  
Department of the Army, 30 October 1973.
- Field Manual 31-3/Air Force Manual 105-4, Weather Sup-  
port for Field Army Tactical Operations. Washington:  
Departments of the Army and the Air Force,  
4 December 1969.
- Field Manual 100-5, Operations. Washington: Department  
of the Army, 29 April 1977.
- Fuller, John P. Weather and War. Scott AFB: Military  
Airlift Command, 1974.
- Metzko, John and Henry Hidalgo. IDA Paper P-1297,  
Weather Information and Tactical Army Activities:  
Part 1, Assessment of the Operational Utility of  
Mesoscale Weather Forecasting Improvement for  
Army Forces. Arlington, Virginia: Institute for  
Defense Analysis, June 1979.



IDA Paper P-1297, Weather Information and Tactical Army Activities: Part 2, Increasing Army Effectiveness Through Improvements in Weather Information Systems. Arlington, Virginia: Institute for Defense Analysis, June 1979.

Training Circular 30-11, Army Tactical Weather.  
Washington: Department of the Army, 29 April 1977.

Training Circular 30-20, Signals Intelligence.  
Washington: Department of the Army, 29 May 1976.

Stakutis, V. J. Effects of Weather on NATO/Warsaw Pact Air/Ground Operations. Bedford, Massachusetts: Mitre Corporation, January 1977.

#### Unpublished Material

Atkins, LTC Gary D. "The Impact of Weather on Military Operations." Unpublished Army War College research paper, Carlisle Barracks, Pennsylvania, 1975.

Culver, Major William C. "Air Weather Service Tactical Weather Support to the US Army: A Problem in Concept." Unpublished Air Command and Staff College research paper, Maxwell AFB, Alabama, 1975.

Kyle, Major Arthur C. "Probability Weather Forecasts: For the Army?" Unpublished Army Command and General Staff College research paper, Ft. Leavenworth, Kansas, 1979.